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ABSTRACT

This study is concerned with the effects of creativity training programs and teacher influence on the development of creativity. An attempt was made to answer the following questions: (1) are two programs equally effective in developing divergent thinking and in fostering positive attitudes about creativity and a self-concept as a creative thinker? (2) does active participation of the teacher facilitate or inhibit the effectiveness of instruction? (3) does the teacher's divergent thinking ability influence the effectiveness of instruction? and (4) are there differential effects due to the interaction of the above three factors? Fifth grade teachers (20) and 473 pupils participated in the investigation. The teachers were identified as high or low on divergent thinking and teachers in each of these categories were assigned randomly to one of the four treatment conditions. Although the results are complex they suggest that the Productive Thinking Program seemed somewhat more productive than the Purdue Creative Thinking Program, particularly in the absence of teacher involvement in the former program. It is also suggested that the teacher's level of divergent thinking ability may have little bearing on the effects of the programs in general. (RSM/Author)

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Effects of Creativity Training Programs and Teacher Influence on Pupils' Creative Thinking Abilities and Related Attitudes

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During the decade of the 60's a vast amount of research was conducted on the psychological nature and measurement of creativity and problem solving. Although the amount of research on instruction in creativity and problem solving also increased during the decade, far less research was devoted to instruction than to psychological and measurement aspects. Guilford (1967a) contended that creative problem solving may be the key to the solution of many of mankind's most pressing social problems. If it is, training in creative problem solving will be sorely needed and research on creativity training is a necessary prerequisite to the design of instructional programs.

Creative thinking and creative problem solving have been conceptualized in many ways. Some approaches have stressed the cognitive aspects of creativity (e.g., Guilford, 1967b), whereas others, such as Barron (1969) for example, have stressed the

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personality or affective components of human behavior which relate to creativity. The present researchers have been concerned with both cognitive and affective outcomes of creativity instruction. Thus, the general question asked in this research was: "Can cognitive and affective aspects of creativity be developed through direct instructional intervention?"

Other recent investigations have also considered the same general problem. The Productive Thinking Program (PTP; Covington, Crutchfield, and Davies, 1966) has been the focus of several such studies, which have been reviewed and evaluated by Treffinger and Ripple (1970). The Purdue Creativity Training Program (PCTP; Feldhusen, Treffinger, and Bahlke, 1970) has also been utilized in several studies (Feldhusen, Bahlke, and Treffinger, 1969; Feldhusen, Treffinger, and Thomas, 1970; Robinson, 1969). Other programs for educational utilization have been developed and evaluated by Davis and Houtman (1968), Myers and Torrance (1965), Cunningham and Torrance (1966), and others.

There have been few attempts, however, to compare the differential effectiveness of two or more creativity instructional programs which purport to develop the same skills and abilities among pupils of the same age. Some researchers have even deplored such comparisons (Stolurow, 1962). However, Feldhusen (1963) argued that the comparative study can often make a significant contribution in the early stages of a research program.

In addition, the influence of the teacher on the effectiveness of the instructional program has been a frequently-mentioned factor in post-hoc discussions of results of creativity research but has not been systematically varied in research studies (cf., Treffinger and Ripple, 1970). The present study, therefore, was concerned with these general problems and was specifically addressed to the following questions:

1. Are two programs designed for use with upper elementary school age children equally effective with respect to the learning criteria of divergent thinking (DT), attitudes about creativity, and self concept as a creative thinker?

2. Does active participation of the teacher in creativity instruction facilitate (or inhibit) the effectiveness of the instruction?

3. Does the teacher's own divergent thinking ability influence the effectiveness of the creativity instruction?

4. Are there differential effects of the creativity instruction due to interaction among the type of program used, the teacher's participation, and/or the teacher's DT ability?

5. Do the effects of the three independent variables differ according to the criterion or dependent variables considered?

Methods and Procedures

Twenty fifth-grade teachers and their 473 pupils in the public schools of a community in Northern Indiana participated in the study. Sixteen teachers and their classes served as experimental instruction groups and four teachers and their classes served as controls. The 16 experimental teachers were given a battery of five sub-tests from the Torrance Tests of Creative Thinking (TTCT; Torrance, 1966). Using median split, the teachers were identified as "high" or "low" on divergent thinking. Teachers in each of these categories (and, therefore, the pupils in their classes) were assigned randomly to one of four treatment conditions (one of the two instructional programs, the Purdue Creative Thinking Program or the Productive Thinking Program; and, active or restricted teacher participation, which will be labeled "discussion" and "no-discussion" respectively). The remaining four classes served as a control or comparison group. Figure 1 illustrates the general design of the study and cell sizes.

	PTP		PCTP	
	DISCUSSION	NO DISCUSSION	DISCUSSION	NO DISCUSSION
TEACHERS ABOVE MEDIAN ON DIVERGENT THINKING	N=35	N=60	N=55	N=58
TEACHERS BELOW MEDIAN ON DIVERGENT THINKING	N=39	N=47	N=44	N=39

CONTROL

N=96

Figure 1. The research model

There were two classes in each of the experimental cells and four classes in the control group.

Before instruction with the creativity instructional programs began, all pupils were given the Torrance Tests of Creative Thinking, Form B. The following subtests were used: Just Suppose, Product Improvement, Unusual Uses, Circles, and Picture Completion. The tests were administered using the standard directions described by Torrance (1966). Eight minutes working time was provided for each subtest except Just Suppose for which the working time was five minutes.

Instructional Programs. The instructional programs have been described in detail in several other sources (e.g., Olton, 1969; Feldhusen, Treffinger, and Bahlke, 1970). The Productive Thinking Program consists of sixteen programmed instructional booklets, in which children are taught to become better problem solvers through the presentation of a number of mystery or detective problems and by utilizing several "guide-posts" for effective thinking. In addition, pupils have opportunities to solve increasingly complex problems, more and more independently, and to develop constructive attitudes about creative thinking.

The Purdue Creative Thinking Program consists of 28 audio tapes, each with accompanying printed exercise; 16 of the tapes were utilized in the present study. The tapes begin with three-

to four-minute presentations of ideas for effective thinking and problem solving, and eight- to ten-minute stories which are historical in content. The stories deal with important people and events in American history. The exercises, which are intended to facilitate the development of divergent thinking abilities, are related to the content of the stories. In the present study, teachers were allowed to select in advance the 16 stories which they considered most closely related to their social studies program. All teachers, however, used the same set of stories and exercises.

The instructional materials were administered at the rate of three units per week, over a period of six weeks (five weeks plus the sixteenth lesson in the following week).

Teacher Participation. All teachers in the instructional groups received a small honorarium, and participated in two workshops after the initial contacts. (Control teachers were told only that their classes were to be tested as part of a larger testing program). None of the teachers in the experimental classes had participated in any previous creativity research.

In the first workshop, teachers in the discussion conditions were given ideas about how the content of the programs might be applied in other ways during the school day, and they were given ideas for bulletin boards and discussions with their pupils.

They were encouraged to conduct a brief discussion with their pupils after each lesson, during which the key points of the program could be highlighted and discussed by the pupils. Each teacher received a summary of the content of the program that would be used in his class.

Teachers in the no-discussion conditions were merely given a description of the instructional programs, and some suggestions for efficient distribution and utilization (e.g., "It's okay to help a child spell a word if he asks you.").

In the second workshop, teachers in the discussion conditions talked about activities which they had attempted with their pupils, and teachers in both conditions (meeting separately) discussed problems or questions about using the programs, which had not been raised at the previous meetings.

Post-tests. After the administration of the instructional program, all pupils were again given a battery of tests. The divergent thinking measures (TTCT, Form A) consisted of the parallel forms of the pre-tests, administered and scored in the same manner as the pre-tests. Interscorer reliability was checked, and it was found that the intercorrelation ranged from .82 to .99.

Pupils also took the Childhood Attitude Inventory for Problem Solving (Covington, 1966), which measures attitudes about creative thinking, and self-concept of creative thinking and problem solving ability.

Analysis of the data. Since analyses of pre-test TTCT scores indicated that the instructional groups differed initially, analysis of covariance procedures were utilized. Three-factor fixed-effects analyses of covariance, in which post-test TTCT scores were used as the dependent variables and TTCT pre-test scores were used as covariates, were conducted. Separate analyses were conducted for each of six sub-scores: verbal and non-verbal fluency, flexibility, and originality. In each analysis, the pre-test sub-scores which corresponded to the dependent variable was used as the covariate. As shown in Figure 1 (above), the three factors were:

(A) Program (PTP or PCTP);

(B) teacher participation (discussion or no-discussion); and

(C) teacher's divergent thinking (above or below median).

For each sub-score of the TTCT post-tests, comparisons of instructional groups and control groups were made utilizing one-way analyses following the procedures described by Winer (1962). When significant differences were observed (the alpha level was set at .05), post hoc tests were conducted using the Newman-Keuls procedures (Winer, 1962).

For the attitude data, the same general model was utilized, except that no adjustments were made for covariates.

Results

The results will first be presented in terms of absolute gain scores from the pre-test to the post-test of TTCT scores. These results are presented in Table 1. Inspection of the data in Table 1 shows that the gains were substantial in all cells for verbal and non-verbal originality while moderate gains were found in all cells for non-verbal fluency and flexibility. Gains for verbal fluency were not uniform across the cells.

The results will next be presented for the analyses of variance and covariance of post-test scores. Significant results are summarized in Table 2.

Verbal fluency. For verbal fluency, pupils who used the PTP and whose teachers were above the median on divergent thinking scored higher than pupils who used the PCTP. This was true for both discussion and no-discussion groups in which PTP was used, and was true across both levels of teacher involvement and divergent thinking ability among the PCTP teachers. Uninstructed pupils scored higher than pupils in the PCTP groups, across both levels of teacher involvement and divergent thinking ability.

Verbal flexibility. For verbal flexibility, the groups which were in the PTP, no-discussion condition with teachers above the median on divergent thinking scores, performed significantly better than either the PCTP or PTP groups which had discussion and teachers below the median on divergent thinking.

They did not score higher than control groups, however. Pupils with teachers above the median on divergent thinking scored higher, in general, than those with teachers below the median.

Verbal originality. For verbal originality, in classes with teachers above the median on divergent thinking, pupils using the PTP with or without teacher involvement, scored higher than PCTP groups with discussion and teachers below the median on divergent thinking. In general, pupils who used the PTP scored higher than pupils who used the PCTP on this variable; and no-discussion groups outperformed discussion groups whether the teachers were above or below the median on divergent thinking.

Nonverbal fluency. For nonverbal fluency, the only significant result was that pupils who had been instructed with the PTP scored significantly higher than control pupils.

Nonverbal flexibility. For nonverbal flexibility, the groups who used the PTP scored higher than controls or PCTP groups. The PTP, no-discussion group with teachers below the median on divergent thinking also scored higher than the PCTP no-discussion groups with teachers above or below the median.

Nonverbal originality. For nonverbal originality, the PTP groups scored higher than controls or PCTP groups. Particularly, no-discussion PTP groups were superior to no-discussion PCTP groups.

The results for attitudes about creativity and self-concept of creative thinking and problem solving ability are summarized in Table 3. There were no significant differences among any of the instructional groups, or between instructed and control pupils, on the self-concept section of the test (Part II). On the part of the test which dealt with attitudes about creativity and problem solving (Part I), however, there were several significant differences. In general, pupils instructed with the PTP, especially in non-discussion groups, scored higher than other groups. This was true for teachers above and below the median on divergent thinking in the PTP groups. Pupils in all PTP groups scored higher than either PCTP or control groups. Pupils in no-discussion groups, regardless of program or level of teachers' divergent thinking ability, scored higher than pupils in discussion groups and controls.

Discussion

In attempting to interpret the complex results obtained in this study, there are very few easy generalizations. One might even question the desirability of interpreting three-way interactions. In general, however, it did appear that all of the instructional arrangements were effective for the divergent thinking functions of verbal and nonverbal originality and for nonverbal fluency and flexibility. No specific instructional

arrangement was uniformly effective across all criteria in the study, in comparison with controls.

In many cases, the groups which used the PTP, particularly in no-discussion groups, tended to score higher than other groups. Furthermore, on verbal subtests, children whose teacher's divergent thinking score was above the median frequently scored higher than children whose teacher scored below the median. This was not the case for nonverbal tests, where the teacher's level of divergent thinking seemed to have less effect.

In addition to general comparisons between instructed groups and controls, however, some differences were observed in comparisons among instructed groups. PTP groups frequently obtained higher scores than PCTP discussion groups, regardless of level of teacher's divergent thinking ability. Teachers being high on divergent thinking ability seemed only to result in higher pupil scores with respect to verbal flexibility.

What do these results mean? It would be tempting to suggest that the PTP seemed somewhat more productive than the PCTP, particularly in the absence of teacher involvement with the former program, and that the teacher's level of divergent thinking ability may have little bearing on the effects of the programs in general.

Yet, such conclusions must be qualified very carefully, and upon close examination of the procedures and the variables in the study, some of the necessary qualifications become quite clear.

Among these qualifications, the following seem particularly important:

(1) The effects of the teacher's level of divergent thinking ability are difficult to assess for at least two reasons. First of all, the median split afforded only a comparison of "high" and "low" in relation to the scores in the sample. It is entirely possible, for example, that the scores obtained by all the teachers in the sample were consistently higher or lower than scores which might be obtained in the population. Thus, if the present sample actually constituted a rather homogeneous group with respect to divergent thinking, differences between them would not be expected. Since there are no norms for teachers as a group on the TTCT, it is impossible to determine whether or not this problem existed. In addition, it may be possible that a teacher's score on the TTCT constitutes a sample of his "creative" behavior which is very limited in relation to the range of actual behavioral differences among teachers in the classroom. If such an influence operated in this study, the usefulness of stratification of the sample in the manner used (especially without independent judgments of the teachers' actual behavior in the classroom) would be impaired. This suggests that future research in which such variables are utilized must seek ways to validate the stratification made on the basis of test scores using other observational criteria.

(2) A second qualification involves the comparison of discussion and no-discussion conditions. In asking teachers in the discussion conditions about their activities, it was observed that there was considerable variability among the teachers. It is entirely possible that some teachers in the discussion conditions did not in fact engage in any activities which were different from those conducted by no-discussion teachers. Unfortunately, no independent observations of the teachers' activities were undertaken, and no attempt was made to "require" any activities of any teacher. Nor was there any direct confirmation that teachers in the no-discussion condition were adequately "non-involved". For this reason, we must be extremely cautious in viewing our results, although they are indirectly in agreement with other research involving the PTP (Wardrop et al., 1969), in which classrooms rated as "non-facilitative" obtained the greatest benefits from the instructional program.

(3) It must also be pointed out that there were certain procedural difficulties which may have influenced the results. It seems quite likely, for example, that the results for the nonverbal measures of divergent thinking were influenced by ceiling effects on the subtests utilized. It is also difficult to assure that pre-test and post-test scoring of the TTCT was based on the same standards.

(4) It may also be important to note, in understanding the comparative absence of influence of the PCTP on divergent thinking, that only 16 lessons from the original 28 were used in this study. Although no previous research has manipulated the number of lessons, it is possible that this reduction in the training program resulted in decreased effectiveness. Furthermore, the lessons were originally designed to be used once a week, but they were used three times a week in this study.

(5) The outstanding performance of the control groups might be due to the fact that three of the four control teachers had previously participated in a creativity training project, and that in that project they had listened to all of the 28 PCTP tapes in which ideas for improving creative thinking are presented. Thus, it is likely that the superior performance of their pupils is a result of the prior teaching experience.

(6) Finally, the results of the study with respect to the attitude instrument suggest an additional caution. Most of the instruments used in the study, as has been described above, were cognitive in nature. The presence of significant effects on attitude scores, as observed in Table 3, suggests that future research with instructional programs which purport to develop creative abilities among pupils should seek to assess more thoroughly and comprehensively the possible effects of such training on affective characteristics of the pupils and teachers.

Table 1

Gains from Pre-test to Post-test
on Torrance Tests of Creative Thinking

Cell	V-Flu	V-Flex	V-Orig	NV-Flu	NV-Flex	NV-Orig
PDH*	5.4	1.0	8.3	4.9	3.7	14.1
PDL	1.8	0.1	3.2	4.3	3.0	11.0
PNH	0.8	0.1	7.4	4.2	2.5	10.4
PNL	7.5	2.1	10.0	3.4	1.9	9.4
CDH	10.0	2.2	12.6	5.4	4.7	11.7
CDL	4.8	0.6	5.0	4.4	4.6	12.9
CNH	12.8	3.0	14.0	5.9	5.0	14.5
CNL	5.8	-0.4	9.1	5.9	5.4	16.1
XXX	9.2	1.8	11.2	3.3	3.2	8.7

*P=Purdue Creative Thinking Program

C=Productive Thinking Program

D=Discussion

N=No Discussion

L=Low Creative Teacher

H=High Creative Teacher

XXX=Control Group

TABLE 2

CREATIVITY - SIGNIFICANT OUTCOMES *

	ANACOVA		NEWMAN-KEULS					
	3-way ANACOVA	1-way ANACOVA	1 Individual cells	2 Programs (A)	3 Discussion (B)	4 Teacher creativity (C)	5 Discussion x Teacher creativity	6 Program x Discussion
Verbal Fluency	A AC ABC	1,2,3,4,5	CNH,XXX, CDH > PNH, PDL CDH > CDL,PDH	XXX, C > P	XXX > D	XXX > L	XXX > DL	
Verbal Flexibility	B C ABC	1,3,4,5	CNH > PDL, CDL		XXX > D	XXX, H > L	XXX,NH > DL	
Verbal Originality	A B C	1,2,3,4,5	CNH,CDH,XXX > PDL	XXX, C > P	XXX, N > D	XXX > L	XXX,NH,NL, DH > DL	
Nonverbal Fluency		2		C > XXX				
Nonverbal Flexibility	A AB	1,2,6	CNL > PNL, PNH	C > XXX,P				CN > PD, PN,XXX
Nonverbal Originality	A AB	1,2,3,4,5, 6	CNL > XXX	C > P,XXX	N,D > XXX	H,L > XXX	NL > XXX	CN > PN,XXX

*In column 1 under the heading "3-way Anacova" the letters refer to significant effects for A) program, B) participation, C) teacher's level of creativity and combinations refer to significant interactions. In column 2 under "1-way Anacova" the numbers refer to significant effects as follows: 1=individual cells; 2=programs; 3=participation; 4=teacher creativity; 5=participation by teacher creativity; and 6=program by participation. Within the table the reference to treatment conditions is as follows: P=Purdue Creative Thinking Program; C=Productive Thinking Program; D=Teacher Participation and/or Discussion; N=No Discussion; H=High Teacher Creativity; L=Low Teacher Creativity; and XXX=Control Group.

TABLE 3

ATTITUDES - SIGNIFICANT OUTCOMES *

	ANOVA		NEWMAN-KEULS					
	3-way ANOVA	1-way ANOVA	1 individual cells	2 Programs (A)	3 Participation (B)	4 Teacher creativity (C)	5 Program x Participation	6 Participation x Teacher creativity
Part I	A B AB	1,2,3, 4,5,6	CNL,CNH > CDL,PDH, CDH,PDL, PNL,PNH, XXX	C > P,XXX	N > D > XXX	L,H > XXX	CN > CD,PD, PN,XXX CD > XXX	NL,NH,DL, DH > XXX
Part II								
TOTAL	A	1,2,3, 4,5,6	CNH,CNL > PNH,XXX CNH > PNL,PDL	C > P,XXX	N,D > XXX	H,L > XXX	CN > PD,CD, PN,XXX	NH,NL,DH > XXX

*See TABLE 2 for key to letters and numbers.

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